Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Rapid mixing utilizing microscale magnets based on microfluidics device RAN ZHOU, MARCEL MEJULU, Purdue University Northwest — Micromixing has been widely used for a myriad of applications in industries ranging from biological engineering to chemical engineering. Almost every chemical assay requires mixing of two or more fluids or reagents with a sample. Recently, to enhance the mixing efficiency using ferrofluid has been widely preferred in biological applications because its mixing efficiency is very high, and it does not require long channels or increased time of contact to achieve homogenous and complete mixing. The ferrofluid can be controlled by external permanent magnets and it does not generate heat to the sample as electromagnet. However, the traditional magnetic method relies on bulky permanent magnet, so it is difficult to control the mixing performance precisely. In this paper, we propose a miniaturized and integrated microfluidic device that can achieve the rapid mixing of ferrofluid and distilled water. To accomplish this, high-gradient microscale magnet was fabricated and integrated at one side of a microfluidic channel by a simple fabrication technique. The microscale magnet was fabricated by injecting and curing a mixture of neodymium powder in a structural channels, and subsequent permanent magnetization. This study further investigates the effect of the total flow rate and ferrofluid concentration on the mixing performance.

Ran Zhou
Purdue University Northwest

Date submitted: 26 Jul 2019 Electronic form version 1.4